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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/075,566	02/13/2002	Hidemitsu Aoki	12688A	1193

23389 7590 10/07/2003

SCULLY SCOTT MURPHY & PRESSER, PC
400 GARDEN CITY PLAZA
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EXAMINER

CHAUDHRY, SAEED T

ART UNIT	PAPER NUMBER
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1746

DATE MAILED: 10/07/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/075,566

Applicant(s)

AOKI ET AL.

Examiner

Saeed T Chaudhry

Art Unit

1746

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 11 September 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 25-51 is/are pending in the application.
- 4a) Of the above claim(s) 26,29-33,36,37,43,46 and 47 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 25,27,28,34,35,38-45 and 48-51 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 3.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

DETAILED ACTION

Applicant's election without traverse of ammonia as the first washer and polycarboxylic acids and ammonium salts of said polycarboxylic acids as the second washer in Paper No. 6 is acknowledged.

Applicant's amendments and remarks filed September 11, 2003 have been acknowledged by the examiner and entered. Claims 1-24 have been canceled and claims 25-51 are pending in this application for consideration.

Double Patenting

Claims 25, 27-28, 34-35, 38, 42, 44-45, and 48 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-5, 10-11, 13 of U.S. Patent No. 6,423,148) in view of Jiang et al.

----- Patent No. 6,423,148) discloses all the limitations as claimed herein. But fails to claim ammonia concentration from .0001% to 0.5% as claimed herein.

In analogous art, Jiang et al. (6,277,203) disclose method of cleaning metallization surfaces such as copper of a semiconductor wafer by applying a mixture of de-ionized water, surfactant and chemical enhancer such as ammonia, citric acid, malic acid, an acetic acid. Wherein ammonia has a concentration of about 0.02% to about 5% (see claims, col. 7, lines 54-58). Both the top and bottom surfaces of the wafer is scrubbed with brushes (see col. 6, lines 33-37). After a conventional chemical mechanical polishing (CMP) operation is performed. The CMP process planarizes the top surface of the copper layer 20 down to the organic dielectric layer 22 and the resulting copper lines 28. However, the CMP process leaves behind a film of particles and metal contaminants ("contaminants") 30 on the surface of the dielectric layer 22

Art Unit: 1746

and the copper lines 28. As is well known in the art, copper has a lower resistance than the aluminum used in the integrated circuit 10 of FIG. 1A. However, copper is also known to be more susceptible to corrosion than aluminum, which makes it even more important to clean contaminants 30 from its surface (see col. 2, lines 1-11).

It would have been obvious at the time applicant invented the claimed process to utilize ammonia at low concentration as disclosed by Jiang et al in the process of 148' patent for the purpose of enhancing the particle removal as disclosed by Jiang et al.

The non-statutory double patenting rejection, whether of the obvious-type or non-obvious-type, is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent. In re Thorington, 418 F.2d 528, 163 USPQ 644 (CCPA 1969); In re Vogel, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); In re Van Ornam, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); In re Longi, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); and In re Goodman, 29 USPQ2d 2010 (Fed. Cir. 1993).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321 (b) and © may be used to overcome an actual or provisional rejection based on a non-statutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.78 (d).

Effective January 1, 1994, a registered attorney or agent of record may sign a Terminal Disclaimer. A Terminal Disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Art Unit: 1746

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claims 25, 27-28, 34-35, 38, 41-42, 44-45, 48, and 51 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ilardi et al in view of Jiang et al.

Ilardi et al (5,498,293) disclose a substrate cleaning method used for cleaning a substrate which has a metal material and semiconductor material both exposed at the surface (see col. 1, lines 18-20) and which has been subjected to a chemical mechanical polishing treatment with a polishing solution (see col. 6, lines 1-5) with a first cleaning the substrate with a first cleaning solution containing ammonia water (see col. 3, line 51) or an aqueous catholyte (see col. 3, lines 56-58), a second step of cleaning the substrate after the first step with a second cleaning solution containing a first complexing agent capable of easily forming a complex with the oxide of the metal material contained in the polishing solution (see col. 5, lines 7-52); wherein the first complexing agent is carboxylic acid or salt of oxalic acid, citric acid, maleic acid, tartaric acid, malonic acid (see col. 5, lines 7-21); wherein complexing agent is polyaminocarboxylic acid and an ammonium salt (see col. 4, lines 8-63); wherein the complexing agent is EDTA (see col. 5, lines 7-29). The reference fails to disclose the use of first cleaning step and a second step. However, Ilardi does teach the cleaning with the same materials all in one step.

In analogous art, Jiang et al. (6,277,203) disclose method of cleaning metallization surfaces such as copper of a semiconductor wafer by applying a mixture of de-ionized water,

Art Unit: 1746

surfactant and chemical enhancer such as ammonia, citric acid, malic acid, an acetic acid.

Wherein ammonia has a concentration of about 0.02% to about 5% (see claims, col. 7, lines 54-58). Both the top and bottom surfaces of the wafer is scrubbed with brushes (see col. 6, lines 33-37). After a conventional chemical mechanical polishing (CMP) operation is performed. The CMP process planarizes the top surface of the copper layer 20 down to the organic dielectric layer 22 and the resulting copper lines 28. However, the CMP process leaves behind a film of particles and metal contaminants ("contaminants") 30 on the surface of the dielectric layer 22 and the copper lines 28. As is well known in the art, copper has a lower resistance than the aluminum used in the integrated circuit 10 of FIG. 1A. However, copper is also known to be more susceptible to corrosion than aluminum, which makes it even more important to clean contaminants 30 from its surface (see col. 2, lines 1-11).

It would have been obvious at the time applicant invented the claimed process to Clean a substrate which has a metal and semiconductor material exposed with two different cleaning steps because Ilardi teaches the same cleaning method with the same cleaning materials. The transposition of process steps or the splitting of one step into two steps, where the processes are substantially identical or equivalent in terms of function, manner and results was held to be not patentably distinguish the process. Ex parte Rubin 128 USPQ 440 (PTO BdPatApp 1959). Further, one of ordinary skill in the art would use the ammonia concentration as disclosed by Jiang et al for the purpose of enhancing the particle removal from the surface and not to etch the copper surface.

Claims 39-40 and 49-50 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ilardi et al in view of Jiang et al as applied to claims 25 and 42 above, and further in view of Hayashida et al.

Art Unit: 1746

Ilardi et al and Jiang were discussed supra. However, the reference fails to disclose treatment with hydrogen peroxide and hydrofluoric acid solution.

Hayashida et al. (5,290,361) disclose hydrogen peroxide and hydrofluoric acid are effective for removing contamination with organic material and part of metals such as Cu, Ag, and natural silicon oxide films (see col. 1, lines 19-34).

It would have been obvious at the time applicant invented the claimed process to utilize hydrogen peroxide and hydrofluoric acid solution for cleaning under surface of the semiconductor as disclosed by Hayshida et al in the processes of Ilardi et al and Jiang et al for the purpose of removing metal and silicon contaminants since Hayashida et al suggested that hydrogen peroxide and hydrofluoric acid are conventional cleaner and would manipulate the ratio of the hydrogen peroxide, hydrofluoric acid and water for better and efficient results.

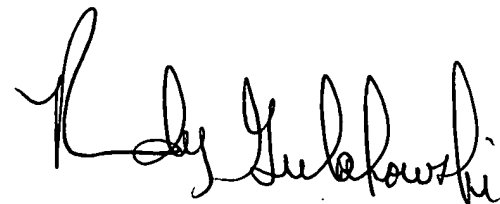
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Saeed T. Chaudhry whose telephone number is (703) 308-3319. The examiner can normally be reached on Monday-Friday from 9:30 A.M. to 5:00 P.M.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mr. Randy Gulakowski, can be reached on (703)-308-4333. The fax phone number for non-final is (703)-872-9310 and for after final is 703-872-9311.

When filing a FAX in Gp 1700, please indicate in the Header (upper right) "Official" for papers that are to be entered into the file, and "Unofficial" for draft documents and other communication with the PTO that are for entry into the file of the application. This will expedite processing of your papers.

Any inquiry of a general nature or relating to the status of this application should be directed to the Group receptionist whose telephone number is (703) 308-0651.

Saeed T. Chaudhry
Patent Examiner
September 29, 2003



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